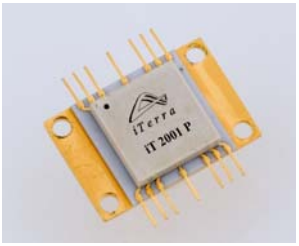
iT2001P
1 to 20 GHz Medium Gain High-Power Amplifier

Description

The iT2001P is a broadband packaged amplifier designed for high output power applications. It provides saturated output power of 1 W up to 7 GHz and greater than 29 dBm up to 14 GHz. Typical gain of 13 dB is provided across the bandwidth. DC power consumption of 5.4 W is obtained in bias condition for best output power and good linear performance. Input and output ports are DC coupled. The iT2001P is fabricated using pHEMT technology with MBE, Ti-Pt-Au gate metallization, silicon nitride passivation, and polymide for scratch protection. Full passivation of the active area and above air bridges provides very high reliability. The package base is made of copper to minimize thermal resistance while also ensuring compatibility between materials. The feedthroughs are realized on a ceramic frame to achieve excellent broadband performance.

Features

- Bandwidth: 1 GHz – 20 GHz
- Psat (1 GHz – 7 GHz): 30 dBm nominal
- Psat (7 GHz – 14 GHz): > 29 dBm nominal
- Psat (14 GHz – 20 GHz): > 26 dBm nominal
- Gain: 13 dB nominal
- DC bias conditions: 9 V at 600 mA
- Ceramic flange-mount package



Absolute Maximum Ratings

(1. Combination of positive supply voltage and supply current per stage (Vd1 x Id1) shall not exceed 50% of maximum total power dissipation (5 W)

Symbol	Parameters/conditions	Min.	Max.	Units
Vd1	Power supply voltage first stage (1)		11	V
Vd2	Positive supply voltage second stage (1)		11	V
Vg21 and Vg22	Positive supply voltage (gate)	-3	5	V
Vd1- Vg11	Gate to drain voltage		12	
Vd2 - Vg12	Gate to drain voltage		12	V
Vg11	Negative supply voltage	-2	0	V
Id1	Positive supply current first stage (1)		800	mA
Id2	Positive supply current second stage (1)		800	mA
Ig1	Negative supply current		3.2	mA
Pin	RF input power		21	dBm
Pdiss_DC	Total DC power dissipation (no RF)		10	W
Tch	Operating channel temperature		150	°C
Tm	Mounting temperature (30 s)		320	°C
Tst	Storage temperature	-65	150	°C

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Recommended Operating Conditions

Symbol	Parameters/conditions	Min.	Typ.	Max.	Units
Tb	Operating temperature range (package base)	-40		70	°C
Vd1	Positive supply voltage first stage			9	V
Vd2	Positive supply voltage second stage			9	
Vg21 and Vg22	Positive supply voltage (gate)		4		V
Vg11	Negative supply voltage		-0.8		V
I_{DQ1}	DC Positive supply voltage first stage		300		mA
I_{DQ2}	DC Positive supply voltage second stage		300		mA

Electrical Characteristics

(at 25 °C)

50 ohm system
$V_{DD1,2}$= +9 V
I_{DQ1} = 300 mA
I_{DQ2} = 300 mA

Symbol	Parameter/conditions	Min.	Typ.	Max	Units
BW	Frequency range	1		20	GHz
S21	Small signal gain 1-5 GHz 5-20 GHz	 13.5 12	 14.5 13		 dB dB
	Gain Ripple			+/-1	dB
S11	Input return loss	8	12		dB
S22	Output return loss	8	12		dB
S12	Isolation	50			dB
Psat	Saturated output power (3 dB gain compression) 1-10 GHz 1-18 GHz 1-20 GHz	 27.5 25.5 24.5	 29.5 27.5 26.5		 dBm dBm dBm
P1dB	Output power at 1 dB gain compression point 1-10 GHz 1-18 GHz 1-20 GHz	 27 25 24	 29 27 26		 dBm dBm dBm

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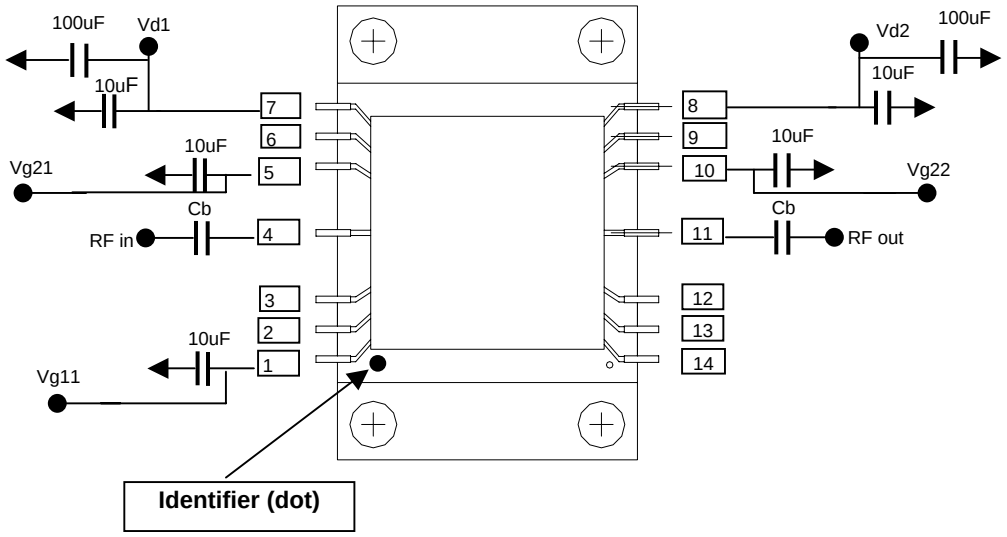
Thermal Characteristics

Symbol	Parameters/conditions	Rth_jb (°C/W)	Tch(°C)	MTFF (h)
Rth_jb	Thermal resistance junction-base of package No RF: DC bias Vd1, 2=9 V, I_{DQ2}+I_{DQ2} = 600 mA, Pdc=5.4 W, Tb=70 C	8	113.2	>>+1E7
Rth_jb	RF applied: Saturated power 1 W, Vd1, 2=9 V, Pdiss=6.5 W Tb=70 C	8	122	>>+1E7

Package Pinouts and Assembly Diagram

Vd1 and Vd2 must be isolated from the bias supply with bypass capacitors of equal or greater value than 100 µF.

The iT2001P is DC coupled. External capacitors Cb are necessary to block DC.



Pinouts

P1:Vg11
P2:N/C
P3:N/C
P4:RF in
P5:Vg21
P6:N/C
P7: Vd1
P8:Vd2
P9:N/C
P10:Vg22
P11:RF out
P12:N/C
P13:N/C
P14:N/C

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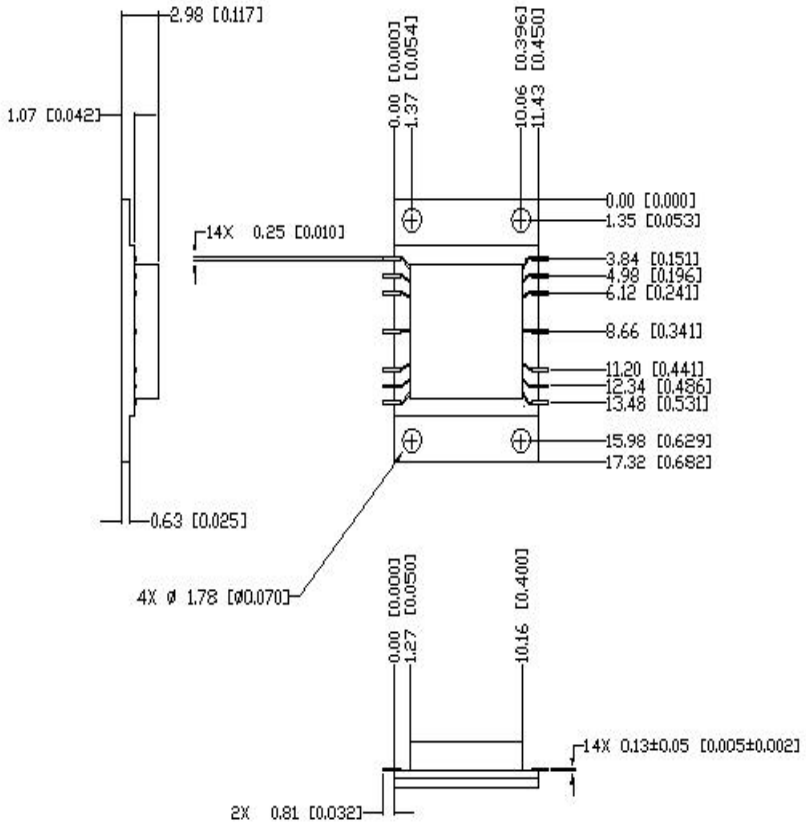
Chip Dimensions

Dimensions are in mm (in.). Base in Cu/W composite material



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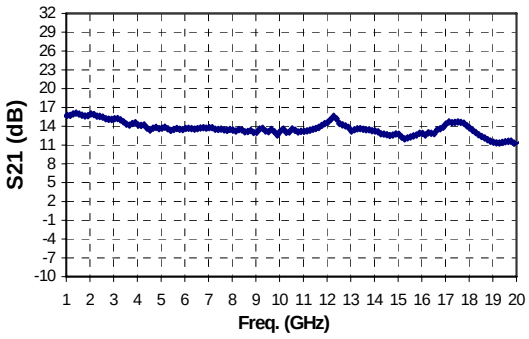
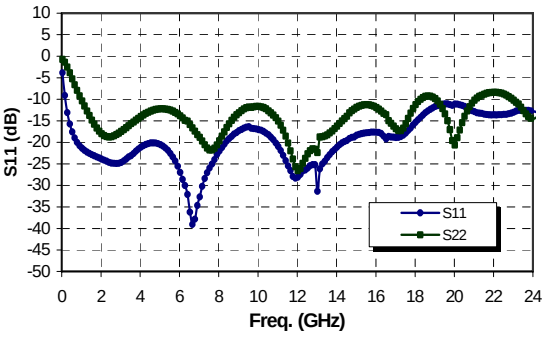
Performance Characteristics

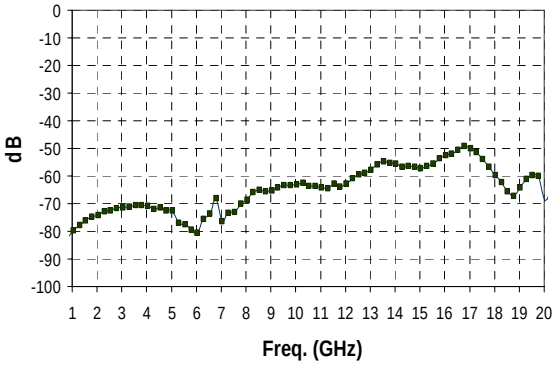
iT2001P Gain Performance



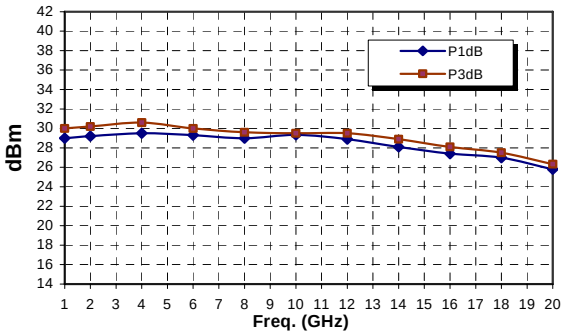
iT2001P Return Loss Performance



iT2001P Isolation



iT2001P Power Performance



Biasing Procedure

The iT2001P amplifier is biased with two positive drain supplies (V_{d1} and V_{d2}) and one negative gate supply (V_{g11}). The bias V_{g11} controls the drain current of two independent cascaded stages. The recommended bias condition for the iT2001P is V_{d1}= V_{d2} = 9.0 V, I_{DQ1} = 300 mA and I_{DQ2} = 300 mA . To achieve this drain current level, V_{g11} is typically biased between –0.7 V and –0.9 V.

V_{d1} and V_{d2} must be isolated by the bias supply by means of bypass capacitors of 100 µF. These two biases can be applied independently. The gate voltage (V_{g11}) MUST be applied prior to the drain voltages (V_{d1} and V_{d2}) during power up and removed after the drain voltage is removed during the power down. V_{g21} and V_{g22} are two positive voltage applied to the gate of a cascode configuration of two different gain stages. For normal operation an external bias of V_{g21} and V_{g22} = +4 V are required ($V_{d1,2}$ =9 V, V_{g11}=-0.7 V).

The iT2001P is DC coupled at both RF input and output ports.

Handling and Mounting

Thin gold solder is recommended for circuit board mounting. The device is susceptible to electrostatic discharge, so preventive measures should be taken during handling and mounting to avoid damage to the chip.

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